

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

=> d his

(FILE 'HOME' ENTERED AT 13:16:10 ON 07 JUL 2003)

FILE 'CA' ENTERED AT 13:16:24 ON 07 JUL 2003

L1 368 S (WATER OR H2O) (2A) (FORMAT? OR GENERAT?) (10A) (PHOTOCHEM? OR  
PHOTOLY?)  
L2 79 S L1 AND(OXYGEN OR O OR O2) AND (HYDROGEN OR H OR H2)  
L3 11 S L1 AND FREE RADICAL  
L4 89 S L2-3  
L5 82 S L4 NOT SPLIT?  
L6 28 S L5 AND(APP OR ISOTOP? OR PEROXIDE OR ATOMIC OXYGEN OR (RAY OR  
1849)/TI)  
L7 20 S L6 NOT(CH2 OR NITRATE OR CO3 OR III OR NH3 OR CHLORO?)  
L8 13 S L7 NOT(HOT OR PHOTOELEC? OR RHOD? OR TANTAL? OR NITRATE)  
L9 9 S L8 NOT(SOLID OR HYDRAZINE OR GERMANE OR METHAN?)

=> d 19 bib,ab 1-9

L9 ANSWER 1 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?Ea0Ch08hFgsOq2XdDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFItUalpGI94Dpu5](https://chemport.cas.org/cgi-bin/cp_sdcgi?Ea0Ch08hFgsOq2XdDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFItUalpGI94Dpu5)

@AhFIWtqyELvTIQsJrqBKh2e24zU7KNo5B0P5KFN6BlCpuT@bYOIE\_UrMuogzWkulTxMy9gayJFLmsCbZeKuwAum2UJUW>

AN 83:69015 CA

TI Flash photolysis-resonance fluorescence study of the formation of atomic oxygen (1D) in the photolysis of water and the reaction of atomic oxygen (1D) with molecular hydrogen, argon, and helium

AU Stief, Louis J.; Payne, Wayne A.; Klemm, R. Bruce

CS Goddard Space Flight Cent., NASA, Greenbelt, MD, USA

SO Journal of Chemical Physics (1975), 62(10), 4000-8

CODEN: JCPSA6; ISSN: 0021-9606

DT Journal

LA English

AB The relative importance of 2 primary processes in the photolysis of water,

H2O+hu ® H+OH (A) and H2O+hu ®

H2+O(1D) (B), was detd. in a direct manner by time resolved detection (via resonance fluorescence) of H and O formed in Processes A and B,

resp. The initially formed O(1D) was deactivated to ground state O(3P) prior to detection via resonance fluorescence. The relative

quantum yields for Processes A and B are 0.89 and 0.11 for the wavelength interval 105-145 nm and 0.99 and 0.01 for the wavelength

interval 145-185 nm. Rate consts. at 300°K were detd. relative to that for Reaction (1), O(1D)+O2 ® O(3P)+O2 (1), by

measuring the increase in H signal or decrease in O signal as a function of H2, Ar, or He pressure for the following reactions:

O(1D)+H2 ® H+OH (2), O(1D)+Ar ® O(3P)+Ar (3), and

O(1D)+He ® O(3P)+He (4). Taking  $k_1 = (6 \pm 1) \times 10^{-11}$

cm<sup>3</sup> mol.<sup>-1</sup>-sec<sup>-1</sup>, we obtain the following results:  $k_2 = (2.5 \pm 1.5)$

$\times 10^{-10}$ ,  $k_3 = (8 \pm 4) \times 10^{-13}$ , and  $k_4 < 5 \times 10^{-14}$  cm<sup>3</sup>

mol.<sup>-1</sup>-sec<sup>-1</sup>.

L9 ANSWER 2 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?@asCg0ThkgsOK2CILzJhF@a@yKM3o8ndVHsGfk0CAjg6FNk\\_UZl7GpI94Dpu5](https://chemport.cas.org/cgi-bin/cp_sdcgi?@asCg0ThkgsOK2CILzJhF@a@yKM3o8ndVHsGfk0CAjg6FNk_UZl7GpI94Dpu5)

@AhFIQtqyELvTIQsJrqBKw2e24zU7KNo5B0P5QFN6BlCpuT@bYOIE\_UrMuogzWkulTxMy9gayJFLms\_b8eluwA2mNUJUV>

AN 79:151508 CA

TI Photochemical separation of hydrogen isotopes using deuterium lamps

AU Basov, Yu. G.; Greben'kov, V. S.; Oginskaya, E. A.  
 CS USSR  
 SO Atomnaya Energiya (1973), 35(2), 132-4  
 CODEN: AENGAB; ISSN: 0004-7163  
 DT Journal  
 LA Russian  
 AB Mixts. of D<sub>2</sub>-H<sub>2</sub>-O<sub>2</sub> (4:1:48, total initial pressure 110 mm Hg) were irradiated by D lamp radiation (output ~340 W) to sep. the H isotopes by the photochem. formation of H<sub>2</sub>O mols. The reaction mechanism proceeds via the following steps: H<sub>2</sub>(1Sg) + hn → H(2S) + H(2S); H(2S) + O<sub>2</sub>(3Sg-) → HO<sub>2</sub>(doublet); HO<sub>2</sub>(doublet) + H(2S) → H<sub>2</sub>O(1A<sub>1</sub>) + O(3P); O<sub>2</sub>(3Sg-) + O(3P) → O<sub>3</sub>(S<sub>0</sub>). At temps. >90°, O<sub>3</sub> is not formed. Exptl. measurements were performed by using a special flow reactor with recycling where the H<sub>2</sub>O vapors were frozen out from the gas mixt. The isotopic compn. of the gas mixt. was detd. with a mass spectrometer. With 2-3 hr the D content in the gas phase increased (the enrichment coeff. increased from 1.965 to 2.36). The D lamps were more efficient in this process than Hg lamps.

L9 ANSWER 3 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?1a0Cw08hFgsOq2XfDzvvhc@j@SKj3J8LdyHsGgk0Ccjq6cNF5tUalpGI94Dpu5@AhFIwtqyELvTIQsJrqBKS2e24zU7KNo5B0P5\\_FN6B1CpuT@bYOIE\\_UrMuogzWkulTxMy9gayJFLm@jbZe7uwAumNUJUn](https://chemport.cas.org/cgi-bin/cp_sdcgi?1a0Cw08hFgsOq2XfDzvvhc@j@SKj3J8LdyHsGgk0Ccjq6cNF5tUalpGI94Dpu5@AhFIwtqyELvTIQsJrqBKS2e24zU7KNo5B0P5_FN6B1CpuT@bYOIE_UrMuogzWkulTxMy9gayJFLm@jbZe7uwAumNUJUn)>

AN 60:65537 CA

OREF 60:11523c-e

TI Photolysis of water vapor and reactions of hydroxyl radicals

AU Ung, A. Y. M.; Back, R. A.

CS Natl. Res. Council Can., Ottawa

SO Canadian Journal of Chemistry (1964), 42(4), 753-63

CODEN: CJCHAG; ISSN: 0008-4042

DT Journal

LA Unavailable

AB The photolysis of water vapor at 1849 Å. was investigated as a possible source of hydroxyl radicals for kinetic studies. At temps. from 23 to 350° and pressures from 1.3 to 28 mm., H and H<sub>2</sub>O<sub>2</sub> were the only detectable products. Expts. with added O indicated that O may have been present as an intermediate at a very low steady-state concn., although this is not certain. Possible mechanisms are discussed. At temps. from 200 to 350° CO appeared to react quant. with the hydroxyl radicals produced in the photolysis of water by the reaction, OH + CO → kCO CO<sub>2</sub> + H. Rates of this reaction relative to those of the reactions, OH + H<sub>2</sub> → kH<sub>2</sub> H<sub>2</sub>O + H, and OH + H, and OH + D<sub>2</sub> → kD<sub>2</sub> HDO + D, were estd. from the decrement in the yield of CO<sub>2</sub> when H or D was added to the H<sub>2</sub>O-CO system, and the following Arrhenius parameters were obtained: (1) EH<sub>2</sub>-ECO = 4.0 ± 0.3 kcal./mole, AH<sub>2</sub>/ACO = 31 ± 5; (2) ED<sub>2</sub>-ECO = 6.4 ± 0.3 kcal./mole, AD<sub>2</sub>/ACO = 160 ± 30; (3) ED<sub>2</sub>-EH<sub>2</sub> = 2.4 ± 0.6 kcal./mole, AD<sub>2</sub>/AH<sub>2</sub> = 5 ± 2. At temps. below 200°, hydroxyl radicals were not completely converted to CO<sub>2</sub>, as the yield of CO<sub>2</sub> increased to a max., then decreased again, with increasing pressure of CO. The mechanism of this system is complex, but probably involves secondary reactions of HCO or COOH radicals.

L9 ANSWER 4 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?6asCU08hFgsOq2XSDzvvhc@j@SKj3J8LdyHsGgk0Ccjq6cNF@tUalpGI94Dpu5@AhFIZtqyELvTIQsJrqBKL2e24zU7KNo5B0P5vFN6B1CpuT@bYOIE\\_UrMuogzWkulTxMy9gayJFLm0Gb8e7uwAgmNU6U@](https://chemport.cas.org/cgi-bin/cp_sdcgi?6asCU08hFgsOq2XSDzvvhc@j@SKj3J8LdyHsGgk0Ccjq6cNF@tUalpGI94Dpu5@AhFIZtqyELvTIQsJrqBKL2e24zU7KNo5B0P5vFN6B1CpuT@bYOIE_UrMuogzWkulTxMy9gayJFLm0Gb8e7uwAgmNU6U@)>

AN 58:57342 CA  
OREF 58:9781c-d  
TI Gas phase photochemical synthesis of hydrogen peroxide  
AU Rowlette, J. J.  
CS Electro-Optical Systems, Inc., Pasadena, CA  
SO Solar Energy (1963), 7, 8-11  
CODEN: SRENA4; ISSN: 0038-092X  
DT Journal  
LA Unavailable  
AB Irradiation of a mixt. of H<sub>2</sub>O and O flowing through a reaction vessel containing a deposited film of photocatalyst produced H<sub>2</sub>O<sub>2</sub>. CdTe (I) served as a photocatalyst when the finely ground catalyst was deposited onto a paper backing that was tacky with an epoxy cement. The catalytic effect of I was destroyed when the material was vapor deposited. ZnO (II) formed over a AgO film also served as a photocatalyst. With I and II quantum yields are highest when H<sub>2</sub>O vapor is in large excess. With II, H<sub>2</sub>O<sub>2</sub> synthesis is observed at wavelengths not absorbed by II.

L9 ANSWER 5 OF 9 CA COPYRIGHT 2003 ACS  
Full Text  
<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?@a0Cw08hFgsOq2XRDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFAtUalpGI94Dpu5@AhFI6tqyELvTIQsJrqBK02e24zU7KNo5B0P5AFN6BlCpuT@bYOIE\\_UrMuogzWkulTxMy9gayJFLm@GbZe7uwAFmNU6UE](https://chemport.cas.org/cgi-bin/cp_sdcgi?@a0Cw08hFgsOq2XRDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFAtUalpGI94Dpu5@AhFI6tqyELvTIQsJrqBK02e24zU7KNo5B0P5AFN6BlCpuT@bYOIE_UrMuogzWkulTxMy9gayJFLm@GbZe7uwAFmNU6UE)>  
AN 50:87257 CA  
OREF 50:16406c-d  
TI Photochemical oxygen-hydrogen reaction at 1849 A  
AU Volman, David H.  
CS Univ. of California, Davis  
SO Journal of Chemical Physics (1956), 25, 288-92  
CODEN: JCPSA6; ISSN: 0021-9606  
DT Journal  
LA Unavailable  
AB cf. C.A. 50, 5412a. The yields of H<sub>2</sub>O<sub>2</sub>, H<sub>2</sub>O, and O<sub>3</sub> were detd. when H-O mixts. were illuminated at atm. pressure with light of wave length 1849.6 A. The predissocn. of O mols. to form O atoms as the primary process following light absorption was shown to be the only reaction of optically excited O. The various mechanisms proposed in the literature were discussed.

L9 ANSWER 6 OF 9 CA COPYRIGHT 2003 ACS  
Full Text  
<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?@asCd08hFgsOq2XuDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFTtUalpGI94Dpu5@AhFIFTqyELvTIQsJrqBK22e24zU7KNo5B0P5CFN6BlCpuT@bYOIE\\_UrMuogzWkulTxMy9gayJFLmsGbZe7uwA2m2UJUV](https://chemport.cas.org/cgi-bin/cp_sdcgi?@asCd08hFgsOq2XuDzvhc@j@SKj3J8LdyHsGgk0Ccjq6cNFTtUalpGI94Dpu5@AhFIFTqyELvTIQsJrqBK22e24zU7KNo5B0P5CFN6BlCpuT@bYOIE_UrMuogzWkulTxMy9gayJFLmsGbZe7uwA2m2UJUV)>  
AN 50:19150 CA  
OREF 50:3903b-c  
TI Hydrogen peroxide photocatalyzed reaction of hydrogen and oxygen  
AU Volman, David H.  
CS Univ. of California, Davis  
SO Journal of Chemical Physics (1955), 23, 2458-9  
CODEN: JCPSA6; ISSN: 0021-9606  
DT Journal  
LA Unavailable  
AB cf. C.A. 45, 6064b. Gaseous mixts. of H<sub>2</sub>O<sub>2</sub>, O, and N, and H<sub>2</sub>O<sub>2</sub>, O, and H were passed through a Vycor reaction vessel transparent to 2537-A. radiation but not to 1849-A. radiation of a Hg-rare gas discharge. In the presence of N, 2.8 × 10<sup>-6</sup> moles/min. of H<sub>2</sub>O<sub>2</sub> were decompd. and 2.8

$\times 10^{-6}$  moles/min. of water were formed. In the presence of H,  $0.4 \times 10^{-6}$  moles/min. of  $H_2O_2$  were decompd. and  $3.6 \times 10^{-6}$  moles/min. of water were formed. In the absence of H, the mechanism for the photodecompn. of  $H_2O_2$  has as one step,  $OH + H_2O_2 = H_2O + HO_2$ . The photocatalytic formation of water can explain results at 1849 Å. for the hydrogen-oxygen reaction.

L9 ANSWER 7 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?tUCIyXbWAJKX1M4xX0P2urchyvJecG2PtzCnJOLNZmhXHSBcV@@@0kxVXSDlZhF20xNDJZFJ12BMyDTJTqPk8FXORluDqFWeK@eACXm@ZCkwgnfvdkv@Thml9Fs3mTolEPV@0Zj900RWz@8HKT0CKARcRI](https://chemport.cas.org/cgi-bin/cp_sdcgi?tUCIyXbWAJKX1M4xX0P2urchyvJecG2PtzCnJOLNZmhXHSBcV@@@0kxVXSDlZhF20xNDJZFJ12BMyDTJTqPk8FXORluDqFWeK@eACXm@ZCkwgnfvdkv@Thml9Fs3mTolEPV@0Zj900RWz@8HKT0CKARcRI)>

AN 46:51322 CA

OREF 46:8528d-f

TI Photochemistry of atmospheric water vapor

AU Bates, David R.; Nicolet, Marcel

CS U.S. Naval Ordnance Test Sta., Pasadena, CA

SO Journal of Geophysical Research (1950), 55, 301-27

CODEN: JGREA2; ISSN: 0148-0227

DT Journal

LA Unavailable

AB Solar radiation dissoc.  $H_2O$  vapor into H atoms and OH radicals.  $H_2$  and  $H_2O_2$  and perhydroxyl ( $HO_2$ ) radicals are also produced as a result of subsequent chem. reactions with the allotropic forms of O. The rate of the oxidizing processes falls off more rapidly with increase of altitude than does that of the reducing processes, and the H compds. are almost completely broken down at about the 90-km. level (or even lower). There is continual escape of the H atoms into interplanetary space; but the liberated O atoms remain in the atm., and the no. that must thus have been added in geol. time seems to be comparable with the no. now present. Consideration of the general equilibrium reveals several features of interest, such as, e.g., the existence of a thin layer of H. In spite of the prominence of the Meinel bands (C.A. 44, 6263a, 9244i) the concn. of OH radicals is quite small. It is thought that these radicals are excited

during, rather than after, their formation. The mechanism proposed is that of 2-body collisions between H atoms and  $O_3$ .

L9 ANSWER 8 OF 9 CA COPYRIGHT 2003 ACS

Full Text

<[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?BUbI2XbWAJKX1M4DX0P2urchyvJecG2PtzCnJOLNZmhXHSB9V@@@0kxVXSDlZhF20x9DJZFJ12BMyDTJTqSk8FXORluDqFWeK@ZACXm@ZCkwgnfvdkv@Thml9Fs3mTolEPV@0Zj900R3z68yKTOCKFRcRs](https://chemport.cas.org/cgi-bin/cp_sdcgi?BUbI2XbWAJKX1M4DX0P2urchyvJecG2PtzCnJOLNZmhXHSB9V@@@0kxVXSDlZhF20x9DJZFJ12BMyDTJTqSk8FXORluDqFWeK@ZACXm@ZCkwgnfvdkv@Thml9Fs3mTolEPV@0Zj900R3z68yKTOCKFRcRs)>

AN 33:59069 CA

OREF 33:8482g-h

TI Mechanism of the formation of hydrogen peroxide during the explosive and catalytic oxidation of marsh gas

AU Polyakov, M. V.

SO Visti Institutu Fizichnoi Khimii, Akademiya Nauk Ukrain's'koi RSR (1938), 8, 99-109

From: Khim. Referat. Zhur. I, No. 11-12, 3-4

CODEN: VIKUAP; ISSN: 0372-5901

DT Journal

LA Unavailable

AB A review of literature on the photochem. formation of water from marsh gas, and of different theories of the role of  $H_2O_2$  in this process. The formation of  $H_2O_2$  (not only during explosion, but also during catalytic oxidation of marsh gas) is discussed. The appearance of the unstable forms (OH,  $HO_2$ ,  $H_2O_2$ ) of intermediate products during the

formation of water from O and H is a factor confirming the peroxide theory of Bach-Engler.

L9 ANSWER 9 OF 9 CA COPYRIGHT 2003 ACS

Full Text <[https://chemport.cas.org/cgi-bin/cp\\_sdcgi?](https://chemport.cas.org/cgi-bin/cp_sdcgi?_UZImXxWIJvXuMXTa0D2JrRhmv8ecG3PMzCnJOUNFmbX9SojI@@kxVXSd1ZhF20xdDJZFJ12BMyDTJTqOk8FXOR1uDqFWeK@IACXm@ZCkwgnfvdkv@Thm19Fs3mTolePV@0Zj9001Izs8HKs0kKaRtR3)

\_UZImXxWIJvXuMXTa0D2JrRhmv8ecG3PMzCnJOUNFmbX9SojI@@kxVXSd1ZhF20xdDJZFJ12BMyDTJTqOk8FXOR1uDqFWeK@IACXm@ZCkwgnfvdkv@Thm19Fs3mTolePV@0Zj9001Izs8HKs0kKaRtR3>

AN 7:21325 CA

OREF 7:3071b-d

TI Activation of Oxygen by Rays

AU Weigert, F.

SO Ber. (1913), 46, 815-20

DT Journal

LA Unavailable

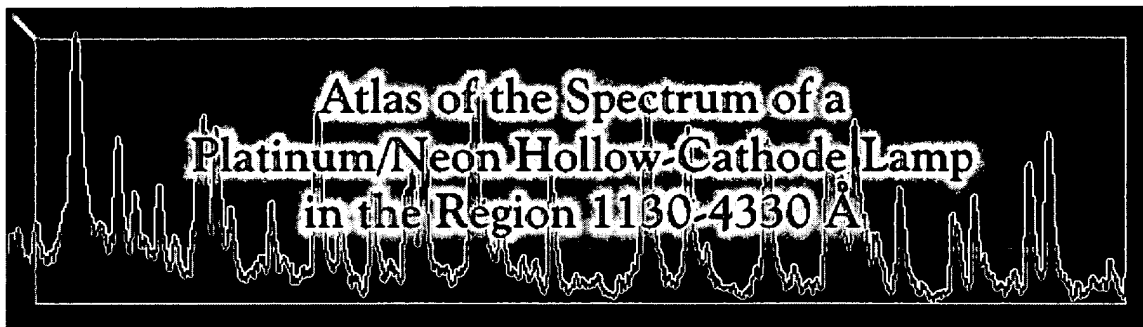
AB W. distinguishes three sorts of photochem. oxidation, namely: (1) the O itself is light-sensitive, i. e., true activation of O; (2) the oxidized substance is light-sensitive; (3) a third substance added to the reacting mixt. is light-sensitive and brings about reaction, i. e., sensitivition. The formation of H<sub>2</sub>O, CO<sub>2</sub> and SO<sub>3</sub> photochemically are cases of true activation of O. W. allowed dry O<sub>3</sub> and H<sub>2</sub> to react in light of wave length 250 mm. No H<sub>2</sub>O<sub>2</sub> was formed. With equal initial quantities of O<sub>3</sub> and H<sub>2</sub> the reaction was H<sub>2</sub> + O<sub>3</sub> = H<sub>2</sub>O + O, but with excess O<sub>3</sub> it was 2O<sub>3</sub> = 3O<sub>2</sub>. He concludes that in the photochem. reactions of H and O, the reacting substance is the one which absorbs light, thus H<sub>2</sub>O absorbs the shortest ultraviolet rays and decomposes to H<sub>2</sub> and O, O<sub>2</sub> absorbs the middle ultraviolet and forms O<sub>3</sub>, O<sub>3</sub> absorbs the longest ultraviolet and undergoes the two reactions shown above.

=> log y

STN INTERNATIONAL LOGOFF AT 13:48:31 ON 07 JUL 2003

Physics Laboratory		NIST	
Physical Reference Data		National Institute of Standards and Technology	
Home	Products and Services	Physical Reference Data	Research Areas
Contact	Search		

## Version History - Disclaimer



Jean E. Sansonetti,<sup>1</sup> Craig J. Sansonetti,<sup>1</sup> Joseph Reader,<sup>1</sup> Nicolo Acquista,<sup>1</sup>  
Alicia M. Sansonetti,<sup>2</sup> and Robert A. Dragoset<sup>2</sup>

<sup>1</sup>Atomic Physics Division

<sup>2</sup>Office of Electronic Commerce in Scientific and Engineering Data  
Physics Laboratory, National Institute of Standards and Technology  
Gaithersburg, MD 20899

## Abstract

The spectrum of a platinum hollow-cathode lamp containing neon carrier gas was recorded photographically and photoelectrically with a 10.7 m normal-incidence vacuum spectrograph. Wavelengths and intensities were determined for about 5600 lines in the region 1130 Å to 4330 Å. An atlas plot of the spectrum is given, with the spectral lines marked and their intensities, wavelengths, and classifications listed. Lines of impurity species are also identified. The uncertainty of the photographically measured wavelengths is estimated to be  $\pm 0.0020$  Å. The uncertainty of lines measured in the photoelectric scans is 0.01 Å for wavelengths shorter than 2030 Å and 0.02 Å for longer wavelengths. Ritz-type wavelengths are given for many of the classified lines of Pt II with uncertainties varying from  $\pm 0.0004$  Å to  $\pm 0.0025$  Å. The uncertainty of the relative intensities is estimated to be about 20%.

---

Atlas	• <a href="#">Measured wavelengths and intensities</a>	<b>DATA!</b>
	• <a href="#">Notes for the Atlas</a>	

---

## Contents

- [Foreword](#)
- 1. [Introduction](#)
- 2. [Photographic Observations](#)
- 3. [Photoelectric Observations](#)
- 4. [Description of the Atlas](#)
- 5. [Accuracy of Wavelengths](#)
- 6. [References](#)
- [Acknowledgments](#)